Hepatitis C Virus Infection among Persons who Inject Drugs in the United States

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HCV in the United States

- **4.1 million HCV*ab* infected persons, with 75% chronically infected (3.2 million)***
- **The most common bloodborne infection in the United States**
- **HCV-related deaths doubled from 1999-2007 to over 17,000/year**
- **Leading cause of liver transplants and liver cancer [hepatocellular carcinoma (HCC)]**
  - HCC fasting rising cause of cancer-related death
- **Injection drug use (IDU) is the principle "driver" of HCV incidence**

*Armstrong et al. *Ann Intern Med*, 2006

Persons Living With Hepatitis C - United States

Virus	Prevalence	% Unaware of Infection	Deaths (2010)
HCV	2.7 M (2.2 – 3.2 M) (est. 3.2-4.9 M)	45%-85%	16,600

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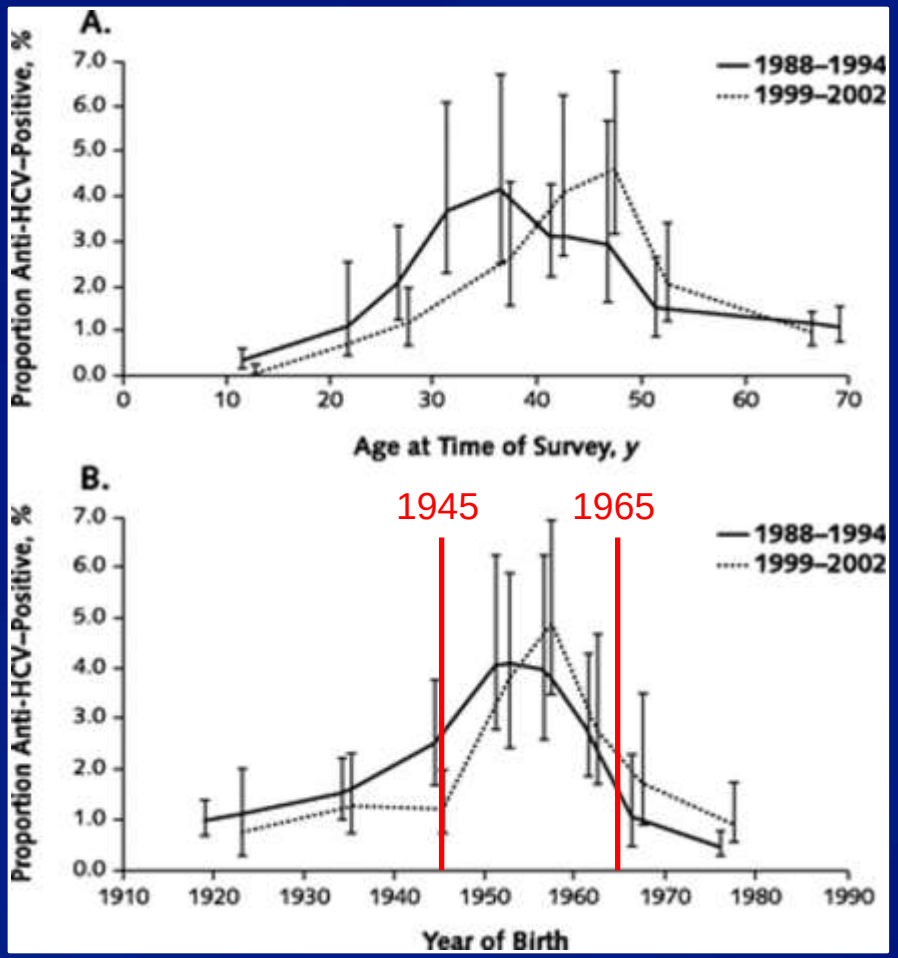
* National Vital Statistics System

Burden of HCV Morbidity and Mortality Among Persons Born 1945-1965

- Prevalence 5.3 times higher than other ages (3.29% vs 0.55%) [1,2]
- Represents 81% of all U.S. adult chronic HCV infections
- Represents 73% of all HCV-associated mortality [4]
- 45% do not report a risk for infection on national surveys



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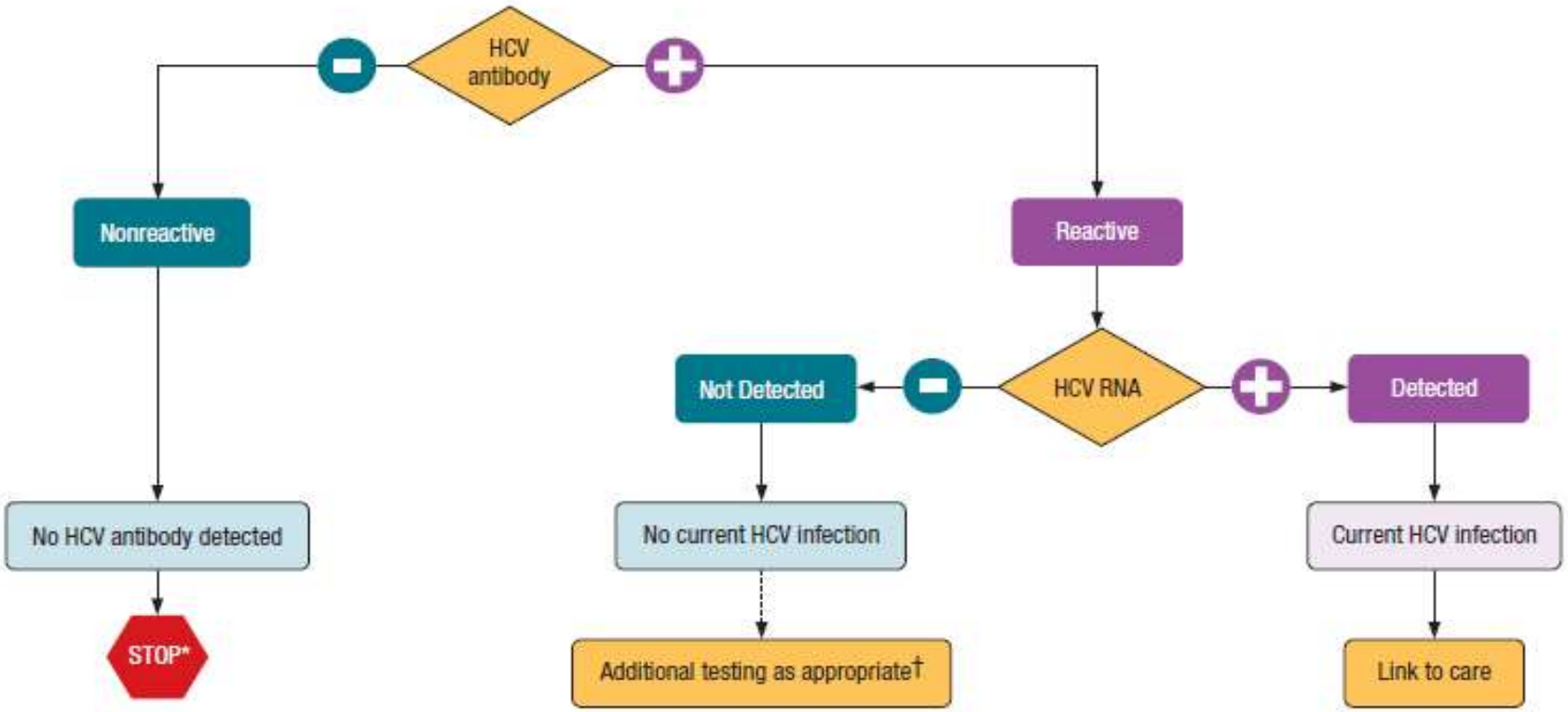
1. Smith, et al. American Association for the Study of Liver Disease Liver Meeting, San Francisco, CA. 2011. 2. Armstrong, et al. Ann Int Med. 2006. 3. Kramer, Et al., Hepatology 2011. 4. Ly, et al. Ann Int Med. 2012.

HCV Infections from Injection Drug Use

- Persons with **history of IDU** – including current use – account for 55.2 (2.2 million) of positive HCV antibody (HCV*ab*) cases[1]
- **IDU** accounts for 50% of all acute infections[2]
- HCVab **prevalence** among PWID between 30 and 70%[3]
- HCV **incidence** among PWID between 16 and 42% per year[4]
- HCVab **prevalence** among **younger injectors** (<30 yo) between 10 and 36%[5]

[1]Armstrong et al. 2006
[2]Daniels et al. 2007
[3]Amon et al. 2008
[4]Klevens et al. 2013; Thorpe et al. 2002
[5]Hagan et al. 2010; Garfein et al. 1998

Recommended testing sequence for identifying current HCV infection (CDC, 2013)

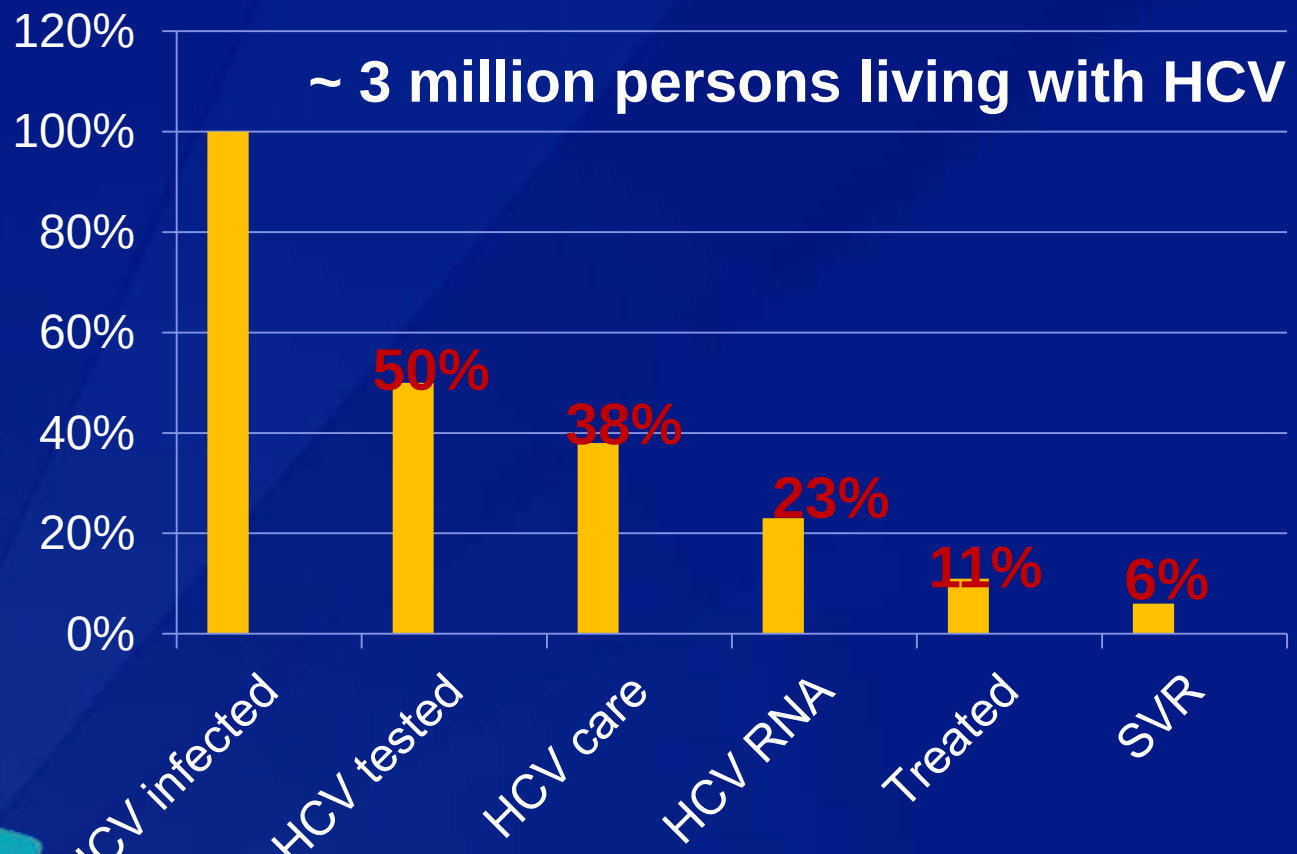


* For persons who might have been exposed to HCV within the past 6 months, testing for HCV RNA or follow-up testing for HCV antibody is recommended. For persons who are immunocompromised, testing for HCV RNA can be considered.

† To differentiate past, resolved HCV infection from biologic false positivity for HCV antibody, testing with another HCV antibody assay can be considered. Repeat HCV RNA testing if the person tested is suspected to have had HCV exposure within the past 6 months or has clinical evidence of HCV disease, or if there is concern regarding the handling or storage of the test specimen.

Source: Testing for HCV Infection: An Update of Guidance for Clinicians and Laboratorians.

HCV Test, Care, and Cure Continuum



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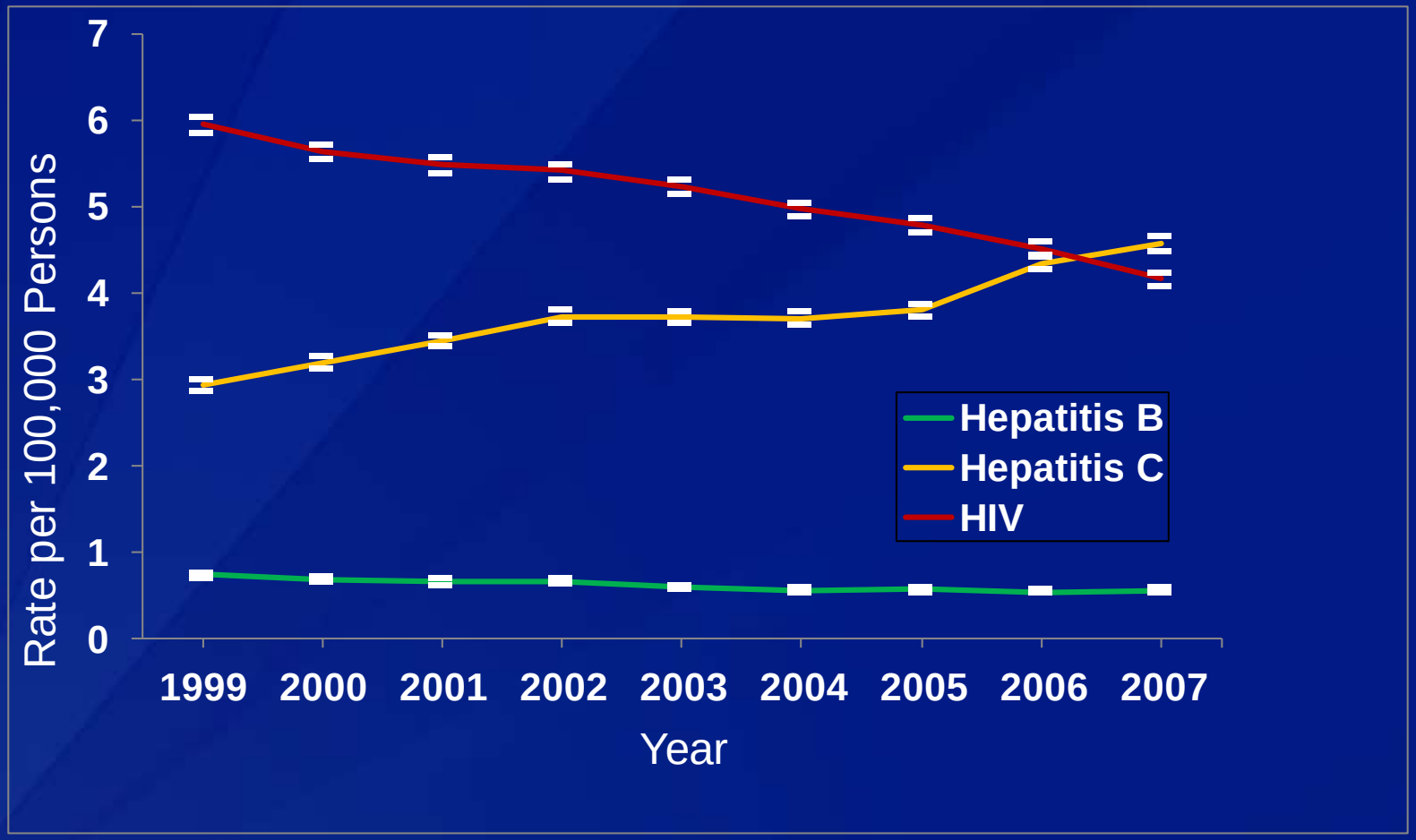
Holmberg S, et al, NEJM, 2013

HCV v. HIV

- From 1996 through 2010, the rate of admission for **HIV fell** from 9.9 per 100,000 people to 5.3, while the rate for **HCV rose** from 2.2 per 100,000 to 10.5*
- **HIV prevalence** is between 1 and 10% while **HCV prevalence** is between 30 and 70%
- 4.1 million persons infected with **HCV*ab*** and 1.2 million persons infected with **HIV**.

*Armstrong et al. *Ann Intern Med*, 2006

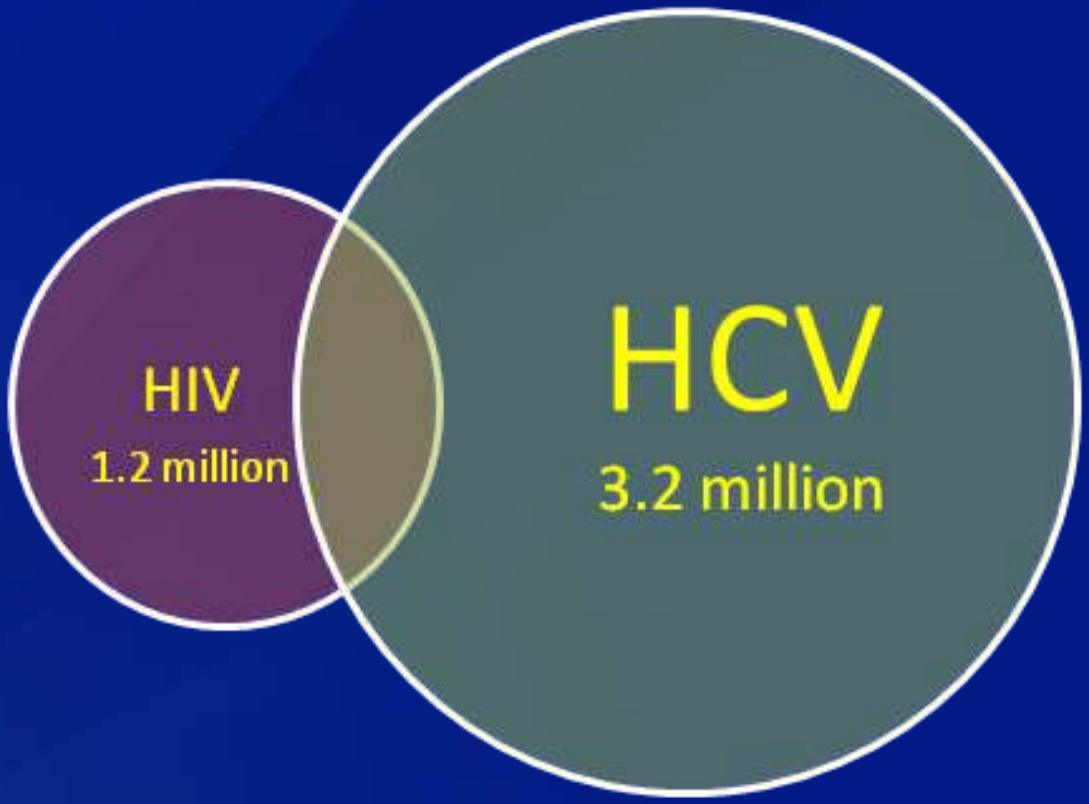
Age-Adjusted Rates of Mortality: Hepatitis B, Hepatitis C, and HIV, United States, 1999–2007*



- In 2007, > 70% of registered deaths in HCV-infected were aged 45-64 years old

*Ly et al. The increasing burden of mortality from viral hepatitis in the United States between 1999 and 2007. Ann Intern Med. 2012, June 5: 156(4):271-8

HIV/HCV Co-infection



HIV and HCV Co-infection

- 4-5 million coinfected persons globally
- Prevalence of co-infection varies by region
  - 25% of HIV infected persons in US
  - 80% in countries with large IDU related epidemics (e.g. China, Vietnam, Ukraine)
- HIV hastens progression of HCV related liver disease
- Liver disease is second leading cause of deaths for persons with HIV/AIDS
- 1.2 million **HIV**-infected persons ***//*** 3.2 million **HCV**-infected persons

G Tossing, Eur J Med 2005; Ragni MV, JID 2001; DAD Study Group AIDS 2010

So why is there such a high HCV prevalence among PWID (30-70%) while HIV prevalence is comparatively lower (1-10%)?

Higher HCV prevalence contributes to higher HCV incidence

Differences in viral infectivity and stability

HCV's Behavioral Risk Profile

Viral Infectivity of HCV persists for:

--Up to 63 days in syringe barrel and dead space

--Up to 21 days in H2O in plastic container

--Up to 14 days on inanimate faces (cookers and inj. surfaces)

--Up to 24 hours in filter; and 48 hours when foil-wrapped

HCV-contaminated solution needs to be heated for almost a 90 seconds and reach temperatures of 144°F for infectivity to be at undetectable levels.

Paintsil et al. Survival of Hepatitis C Virus in Syringes: Implication for Transmission among Injection Drug Users. *JID,* 2010

Doerrbecker et al. Inactivation and survival of hepatitis C virus on inanimate surfaces. *J ID,* 2011

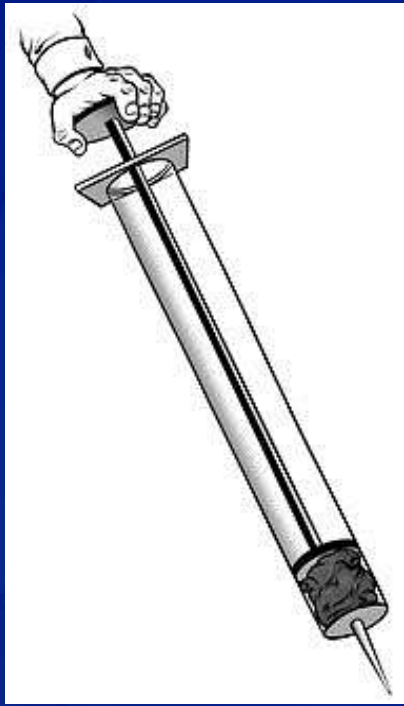
Doerrbecker et al. Transmission of Hepatitis C Virus Among PWID: Viral Stability and Association With Drug Preparation Equipment, *JID*, 2012

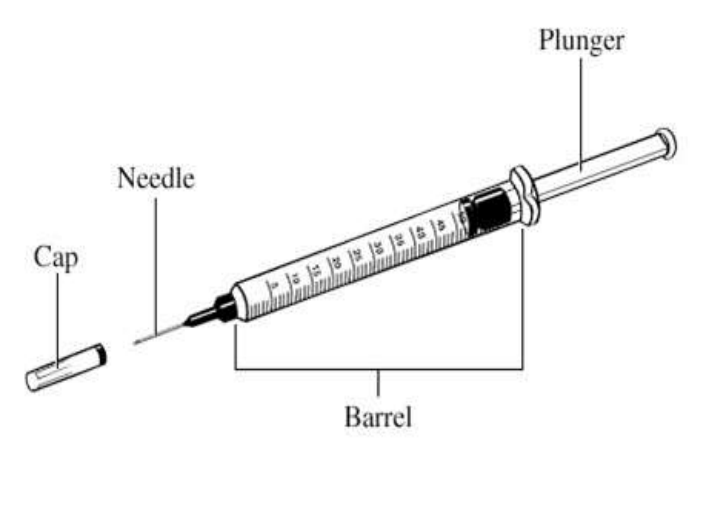
HCV presents a unique set of behavioral risks for PWID

These viral characteristics transform **every** piece of injecting equipment —syringes, cookers, filters, rinse water, mixing water, alcohol swabs, tourniquets and injecting surfaces— into a *primary* transmission vector.

HCV's protracted infectivity and environmental stability has the potential to transform the entire injection episode into a substantial risk factor since the setting itself contains a plethora of mandatory equipment that can harbor and transmit HCV.

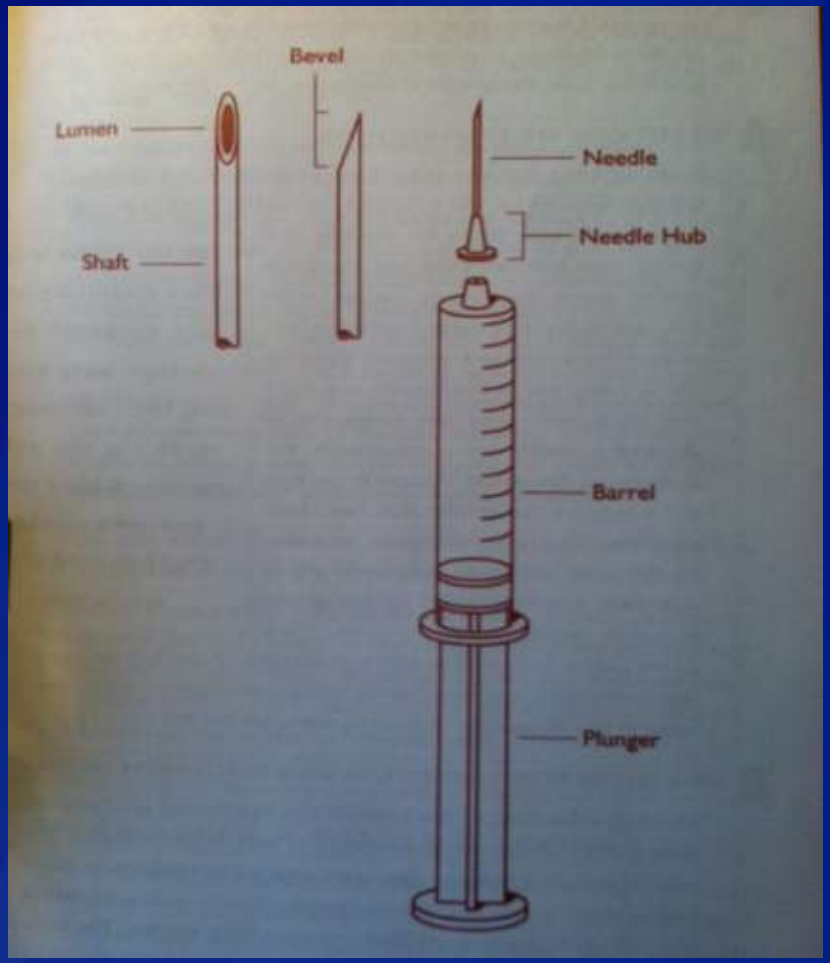
Needles and Syringes





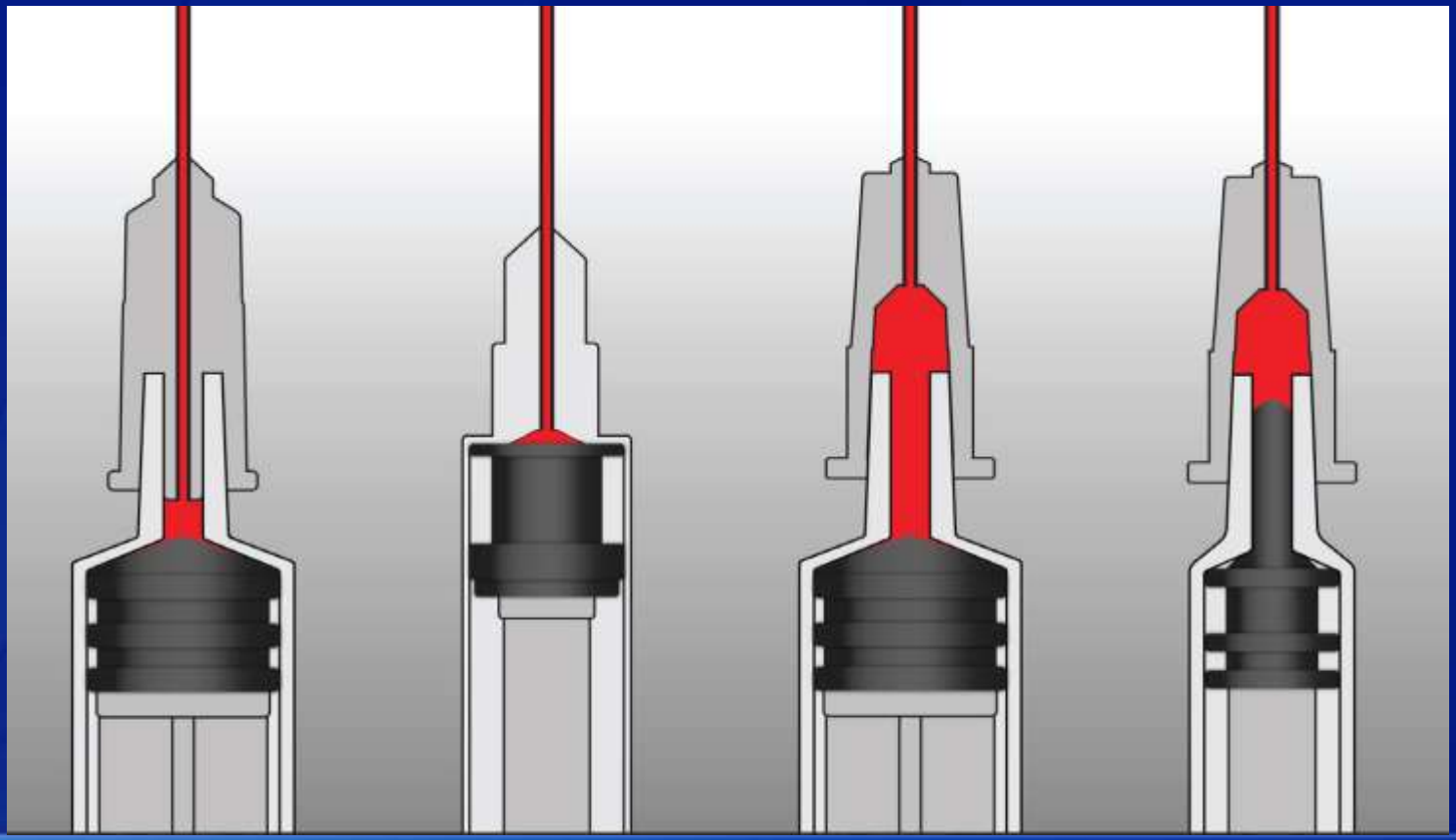
Fixed (i.e. Integrated) Needles

Detachable Needles

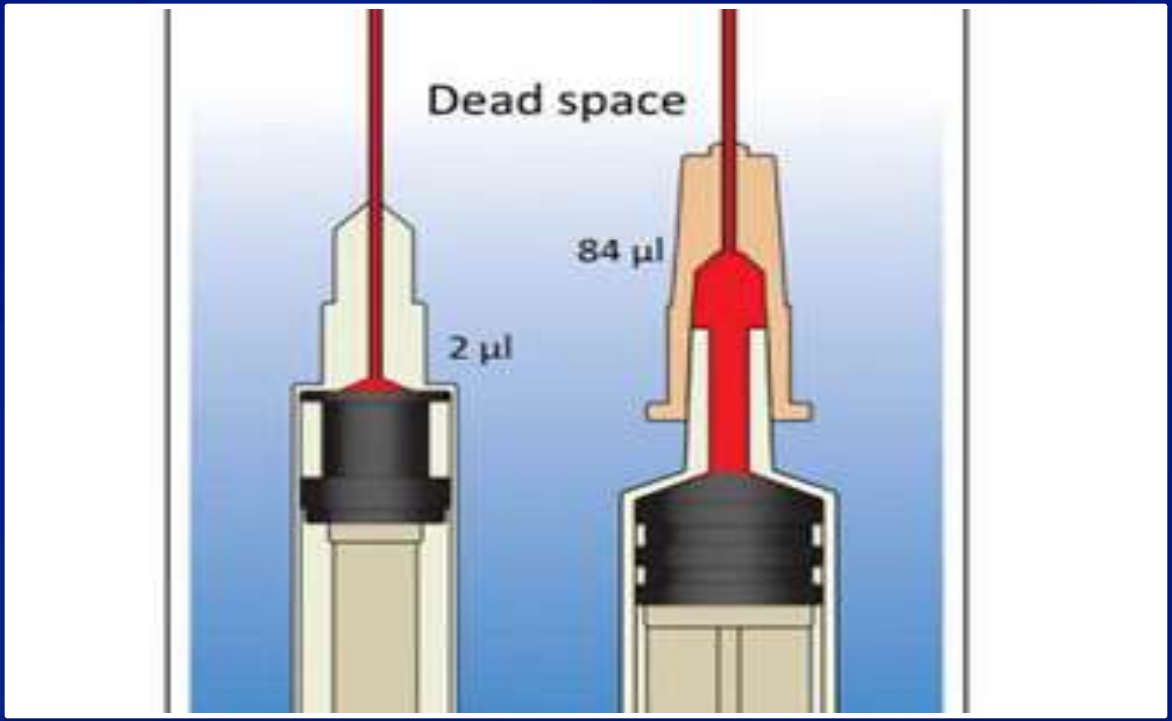


Dead Space – all syringes have it

The space between the tip of the syringe —i.e. the hub of the needle— and the needle itself contains small amounts of solution when the plunger is fully depressed



Mean volume of fluid retained with plunger depressed



HDSS are able to retain 1000 times more blood after rinsing than LDSS

Preparation Equipment

Filters

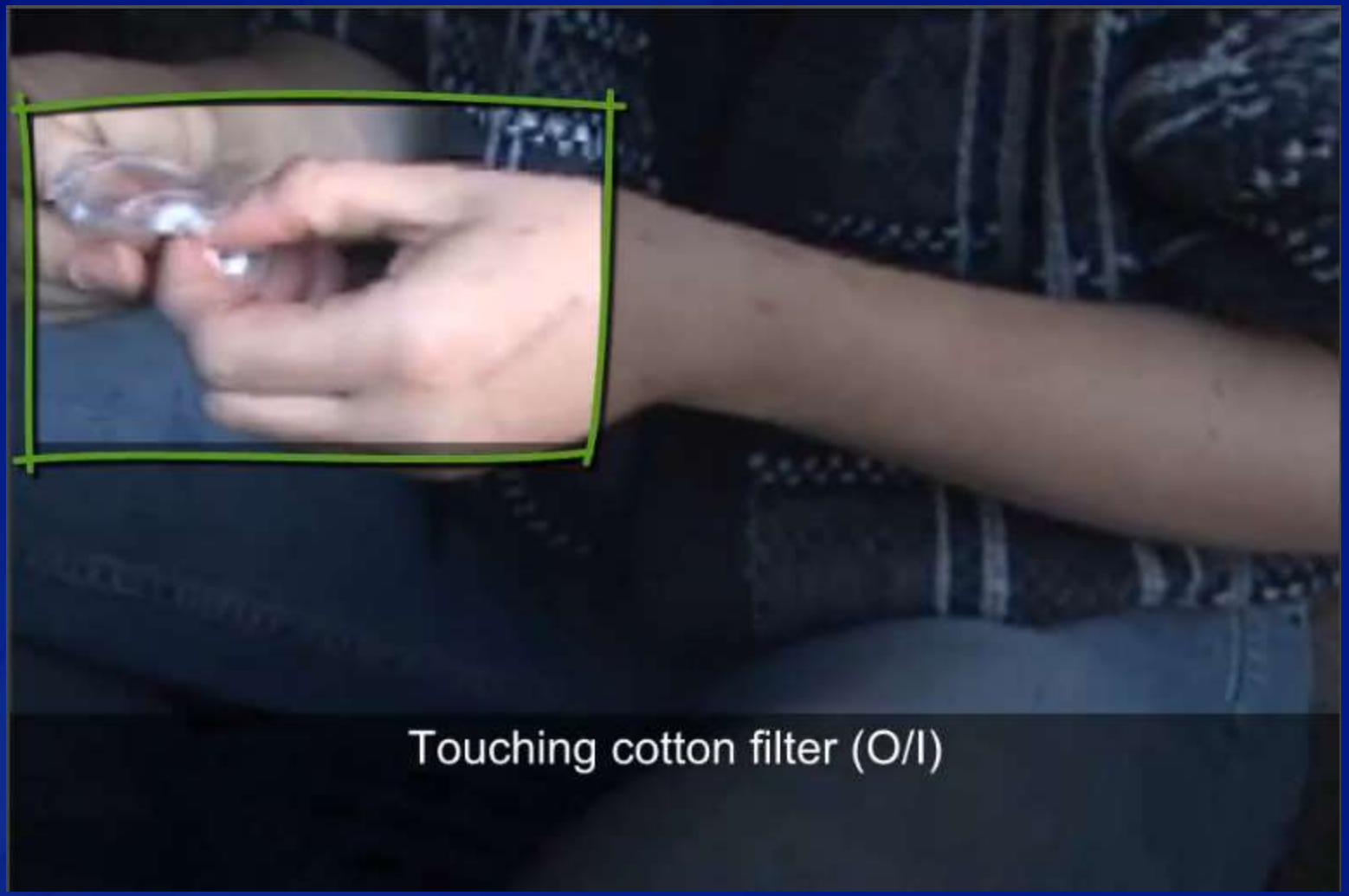
Cookers

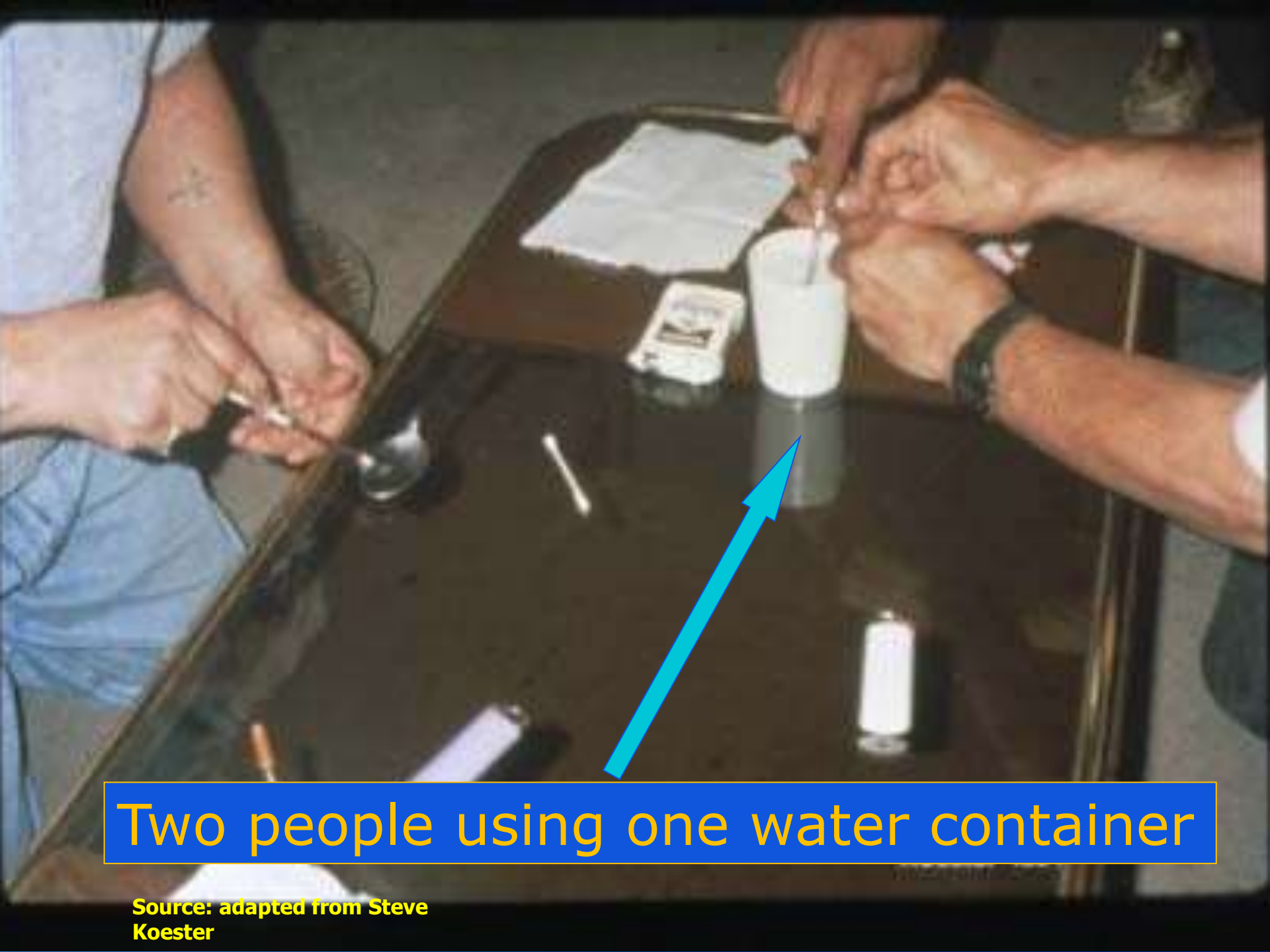
Water

Surfaces

Bloody Fingers

fingers on cooker and in solution


Touching cotton filter (O/I)



Source: adapted from Steve Koester

“Fishing” for a Vein

Increasing reports of injection-related HCV infections among persons under 30 years aged

- **Massachusetts**

MMWR, **Hepatitis C Virus Infection Among Adolescents and Young Adults – Massachusetts, 2002—2009,** May 6, 2011 / 60(17);537-541

- **Upstate New York**

MMWR. **Use of enhanced surveillance for hepatitis C virus infection to detect a cluster among young injection drug users---New York, November 2004—April 2007**. 2008; 57:517—21.

- **Wisconsin**

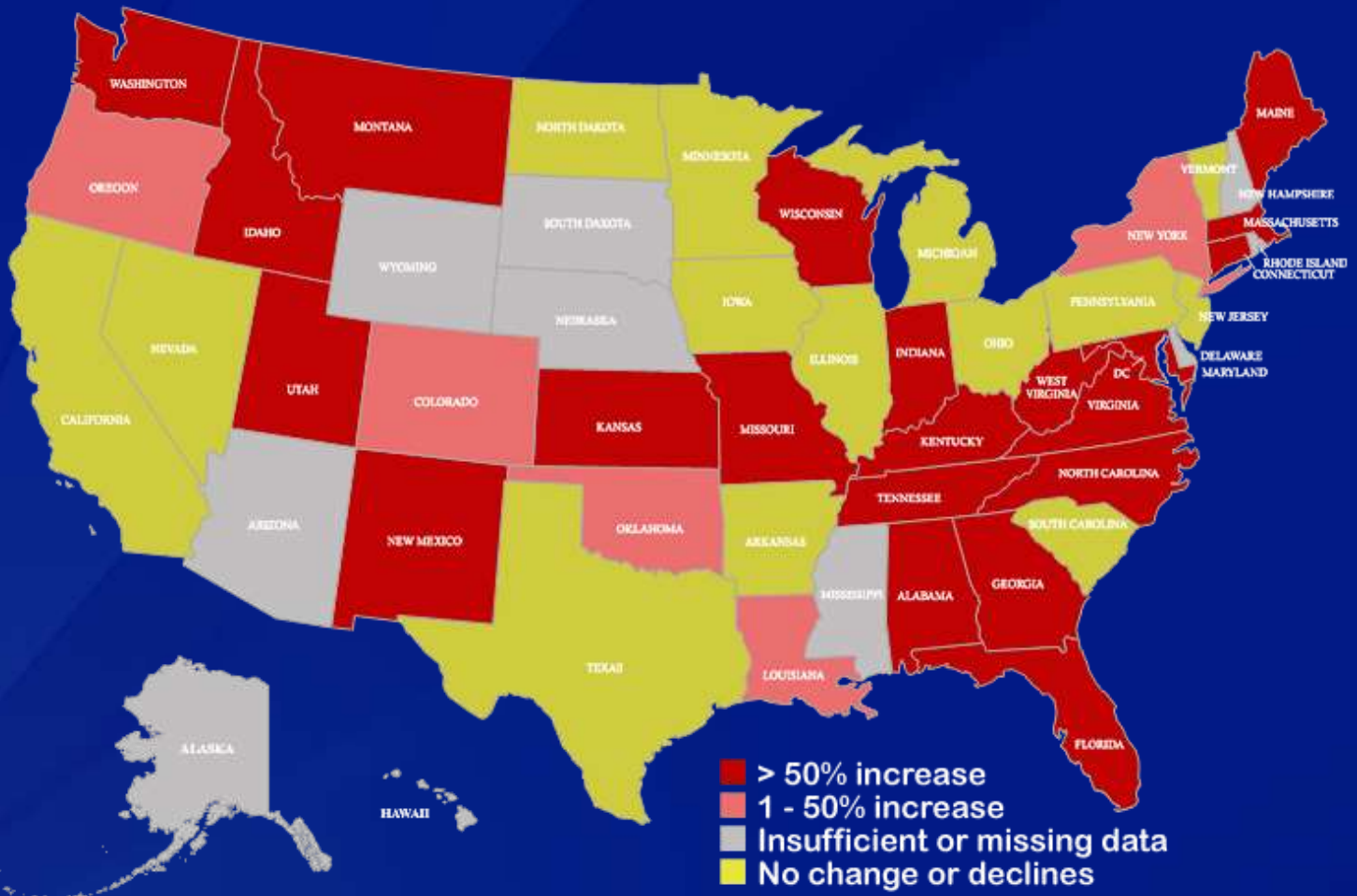
MMWR, **Notes from the Field: Hepatitis C Virus Infections among young adults – rural Wisconsin**, **2010**, May 18, 2012 / 61(19);358-358

- **Additional states reporting increases in HCV cases: Alabama, Colorado, Connecticut, Georgia, Indiana, Kentucky, Maine, Maryland, Montana, New Mexico, North Carolina, Oregon, Tennessee, Washington and West Virginia**

Changing Demographics of HCV Incidence

- During 1990s anti-HCV prevalence was higher among men, African Americans, urban residents and persons 40-49 years aged.
- New cases largely involve males and females equally; mostly white, rural and suburban residents; persons 18-29 years aged.
- Key difference is the non-medical use of prescription opioids

Increases in Reports of New HCV Infection
HCV Case Reports- 2007-2011



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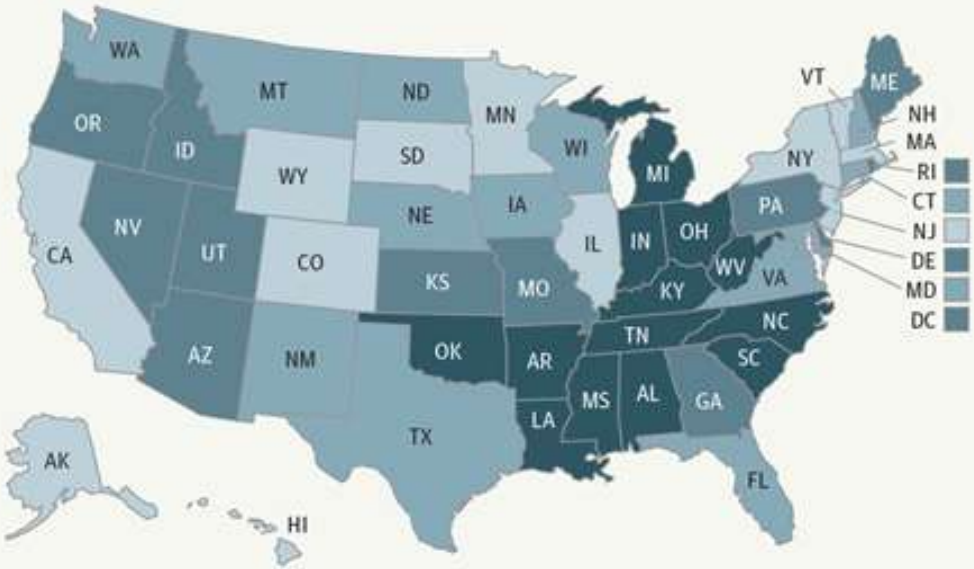
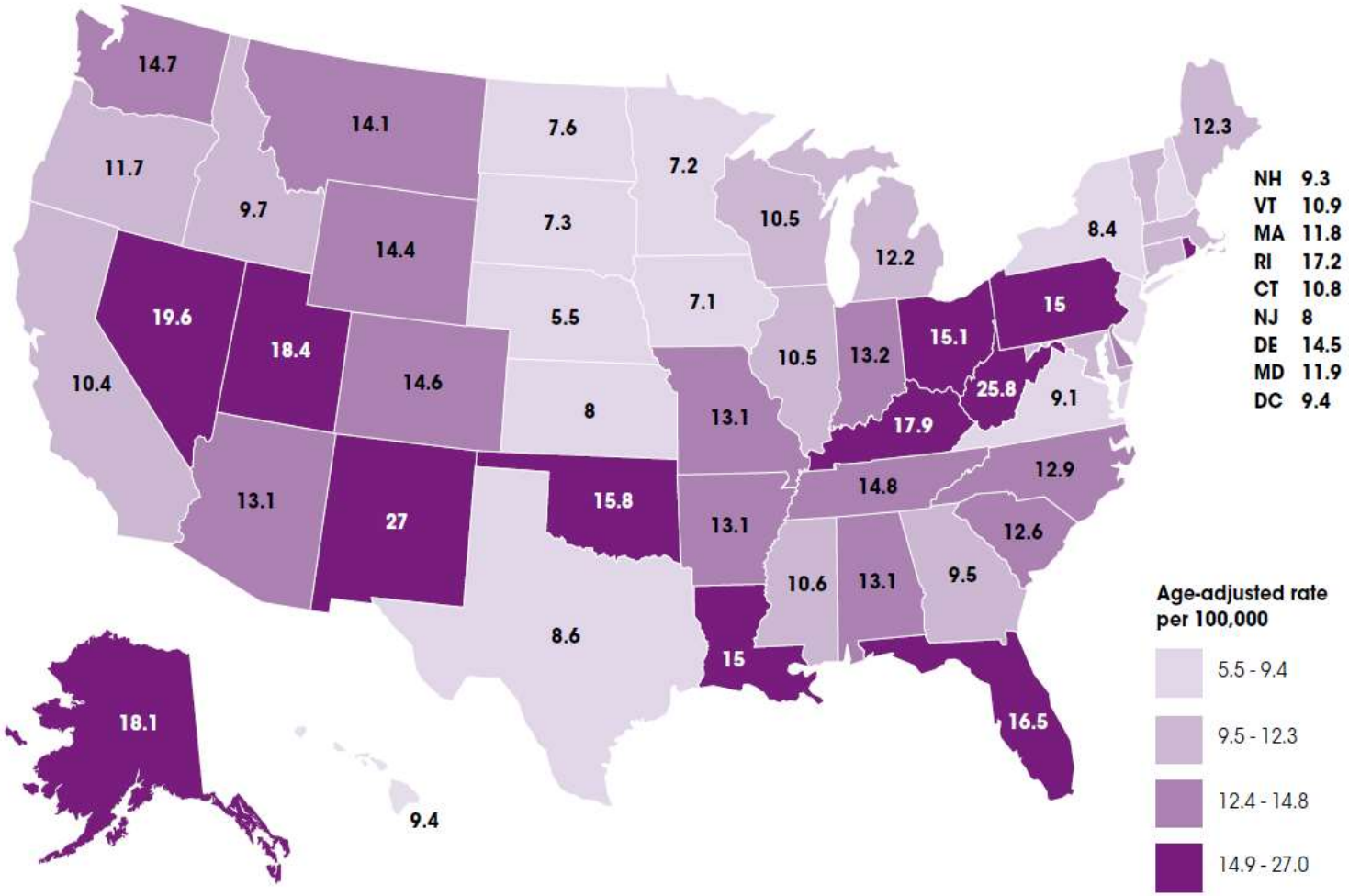
Painkiller Prescriptions per 100 People by State: United States, 2012.

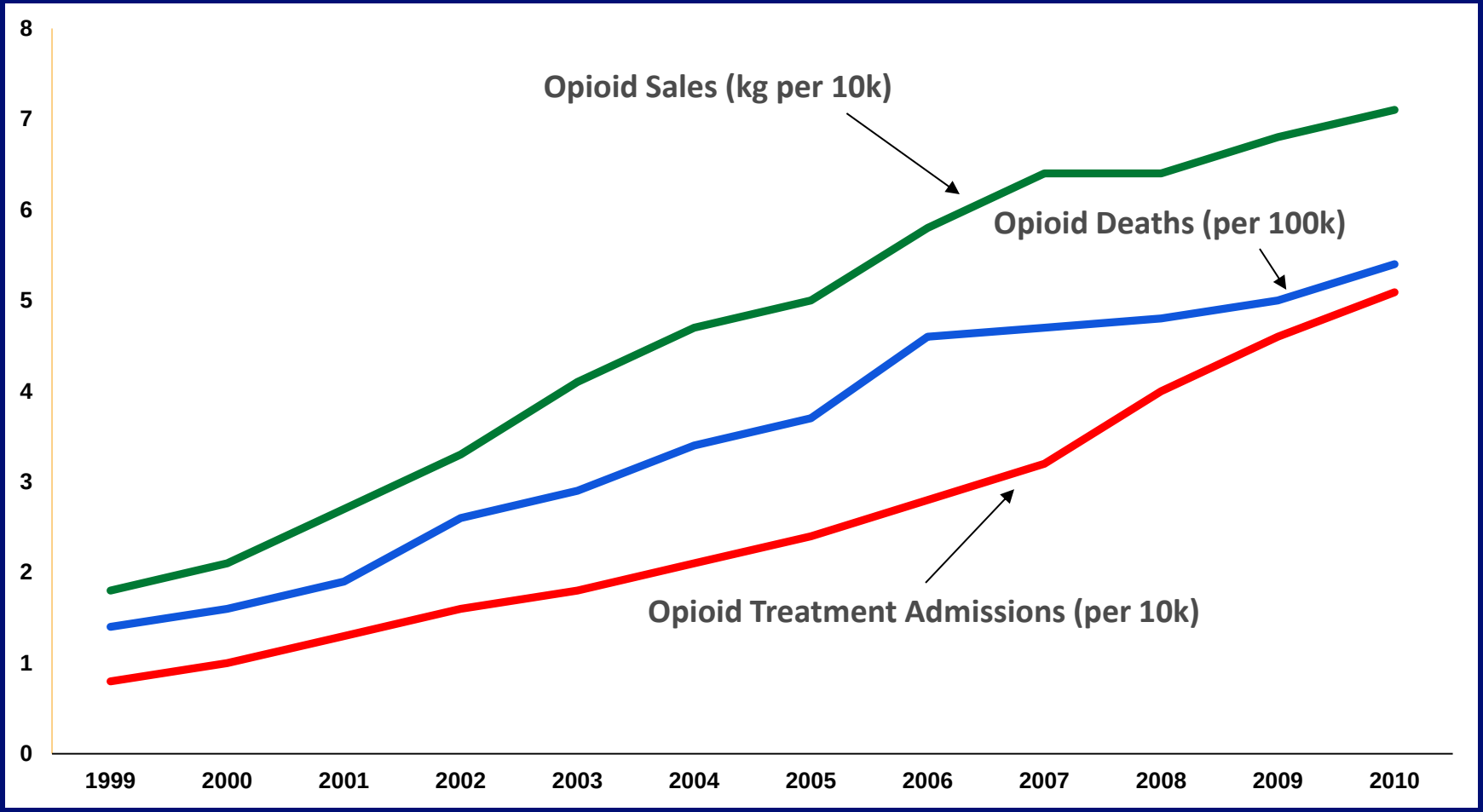


Data Source: IMS National Prescription Audit (NPA), 2012.
Source: Centers for Disease Control and Prevention *Vital Signs*.
http://www.cdc.gov/vitalsigns/opioid-prescribing/infographic.htm/#infographic1. Accessed July 21, 2014.

Drug overdose death rates by state, 2008[4]

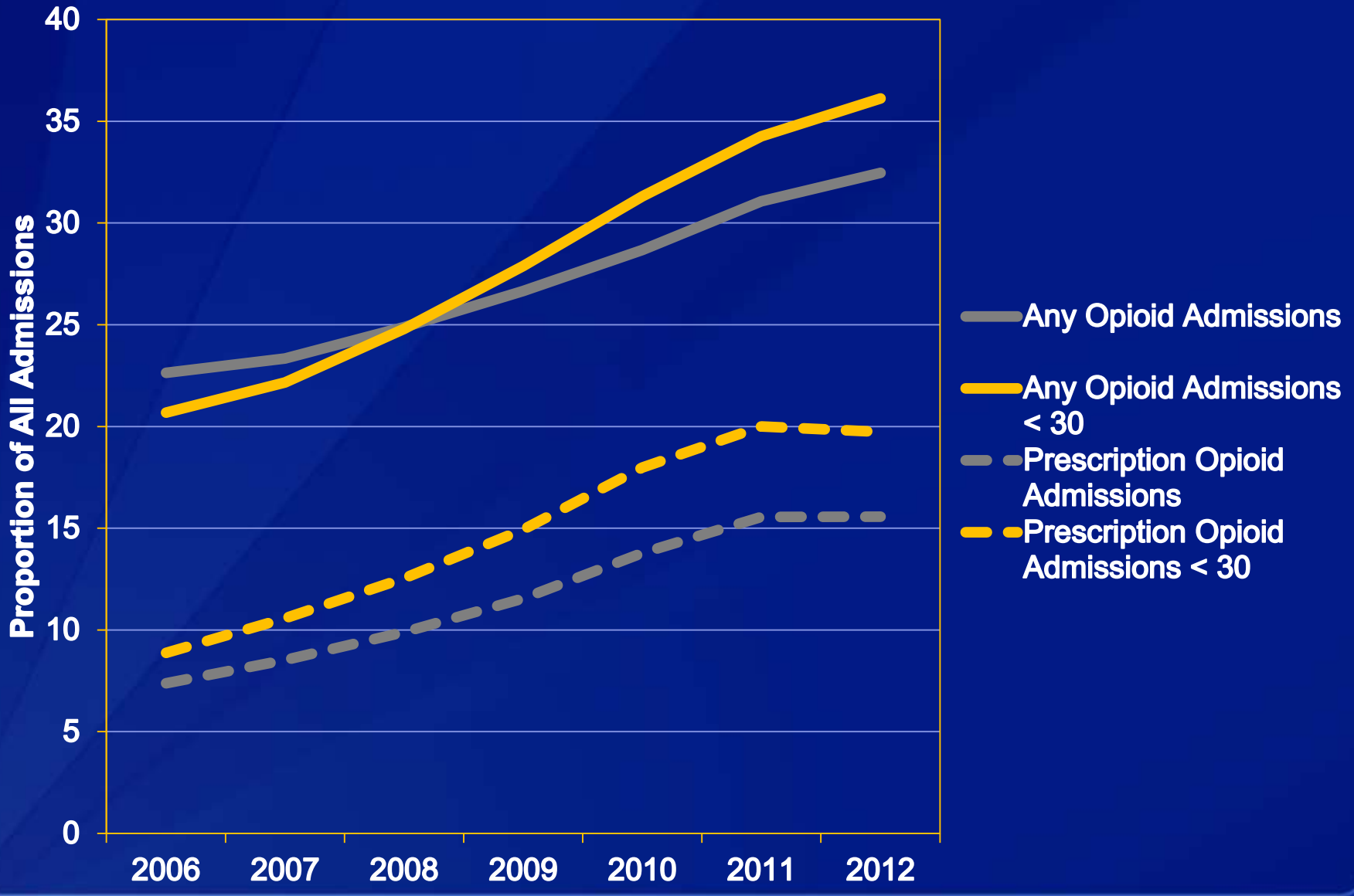


Opioid deaths, sales, and treatment admissions have increased in lock step

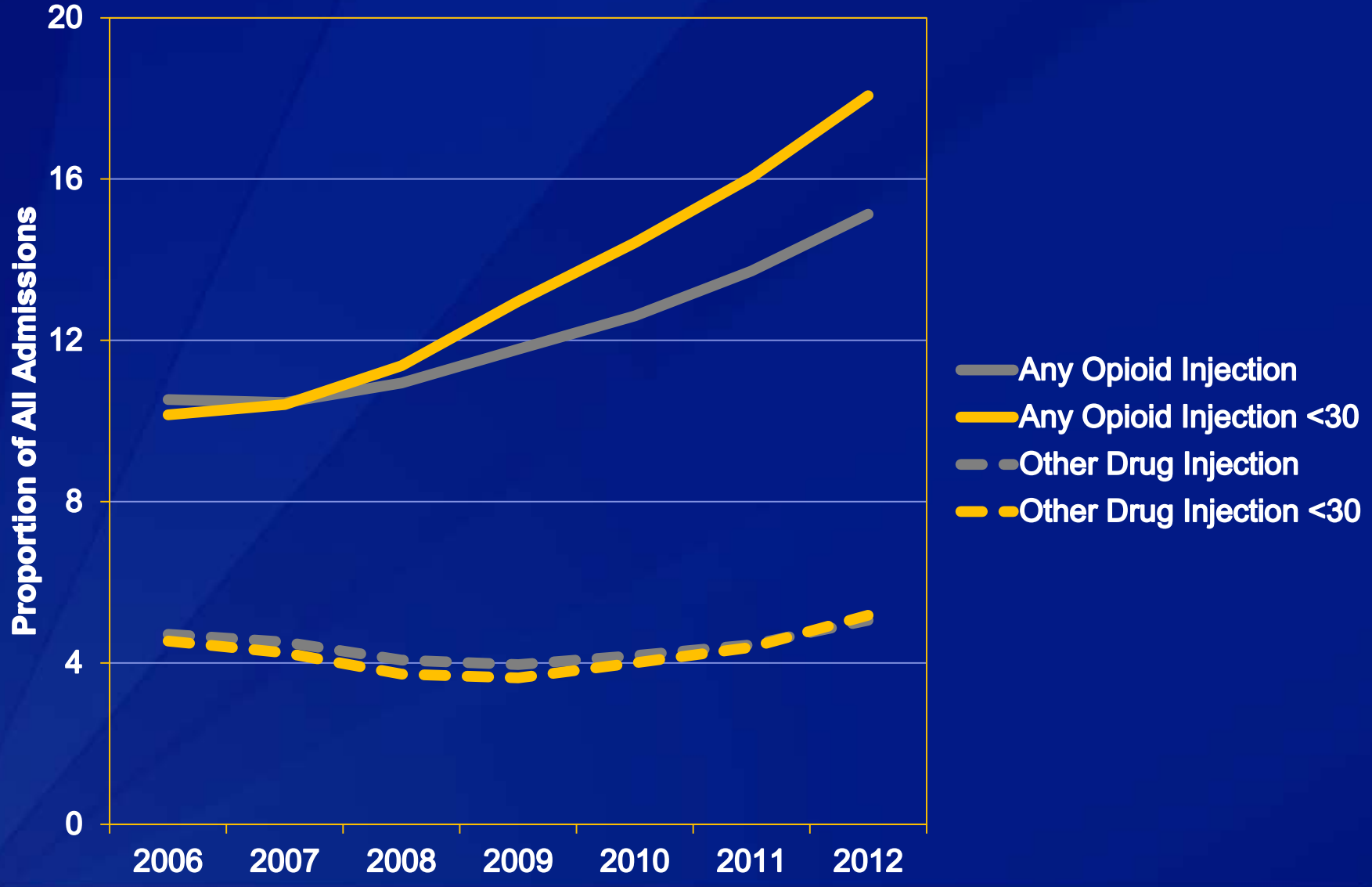


National Vital Statistics System, DEA's Automation of Reports and Consolidated Orders System, SAMHSA's TEDS: National Center for Injury Prevention and Control

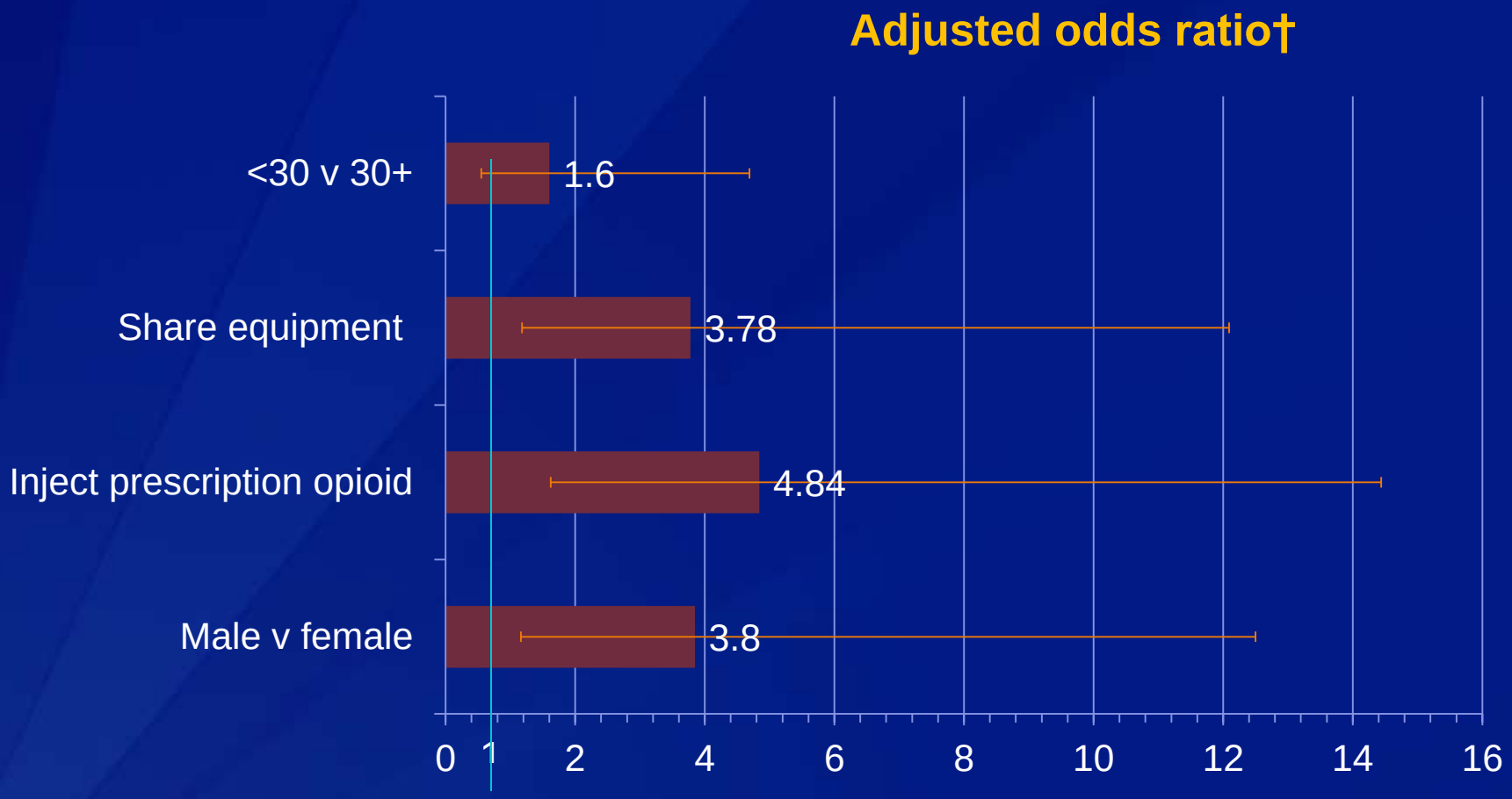
National Drug Treatment Admissions: All ages vs. <30



National Drug Injection Trends: All ages vs. <30



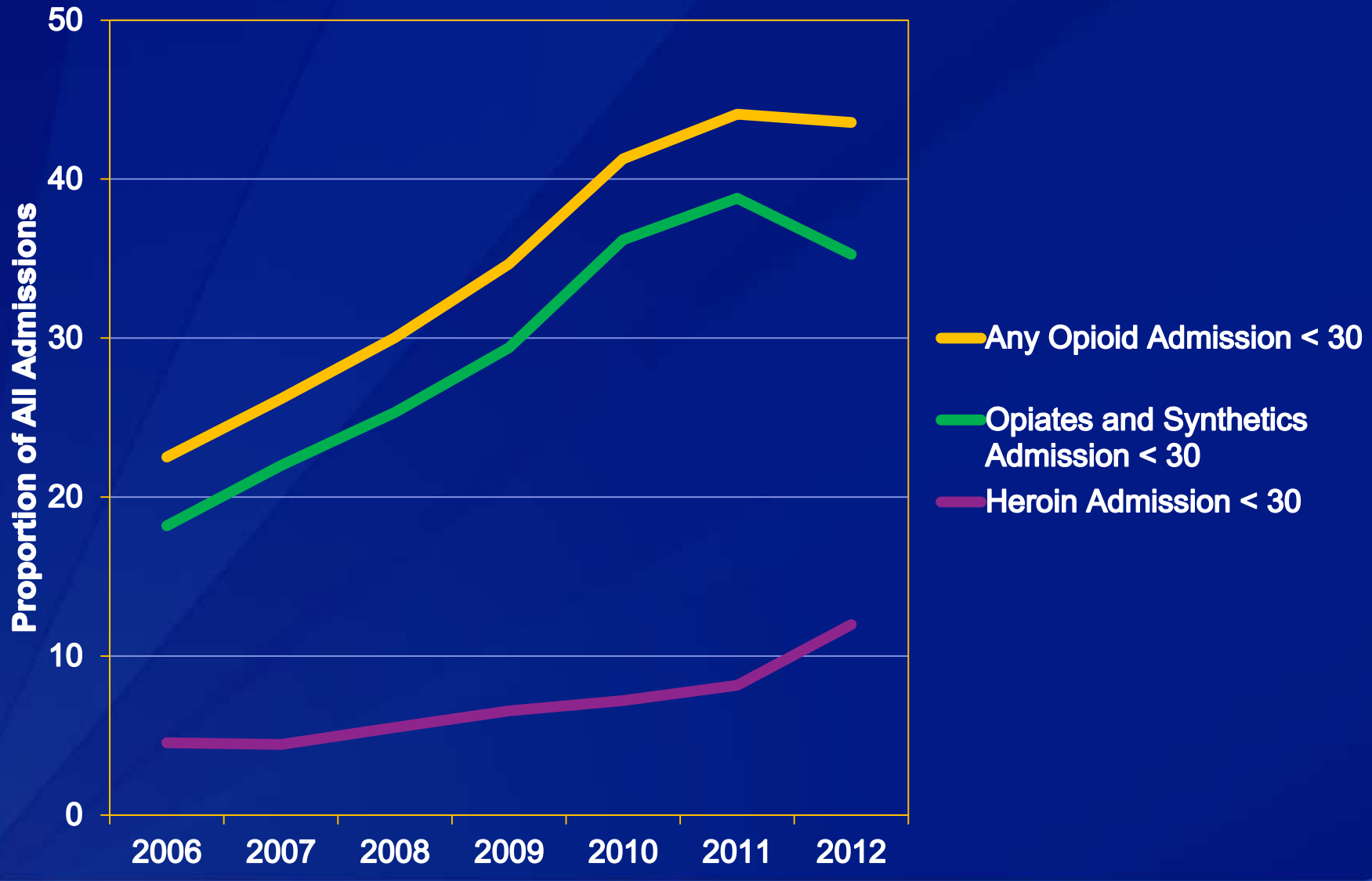
Multivariate Associations with anti-HCV positivity*



*Equipment sharing, injecting prescription opiate , fishing for a vein, and using an SEP are all measured for within the past 12 months. Prescription opiates respondents reported injecting Opana (n=58), Oxycontin (n=21), Dilaudid (n=7), Roxycontin (n=3), Morphine (n=4); Vicodin (n=1), Percocet (n=1) (categories not mutually exclusive)

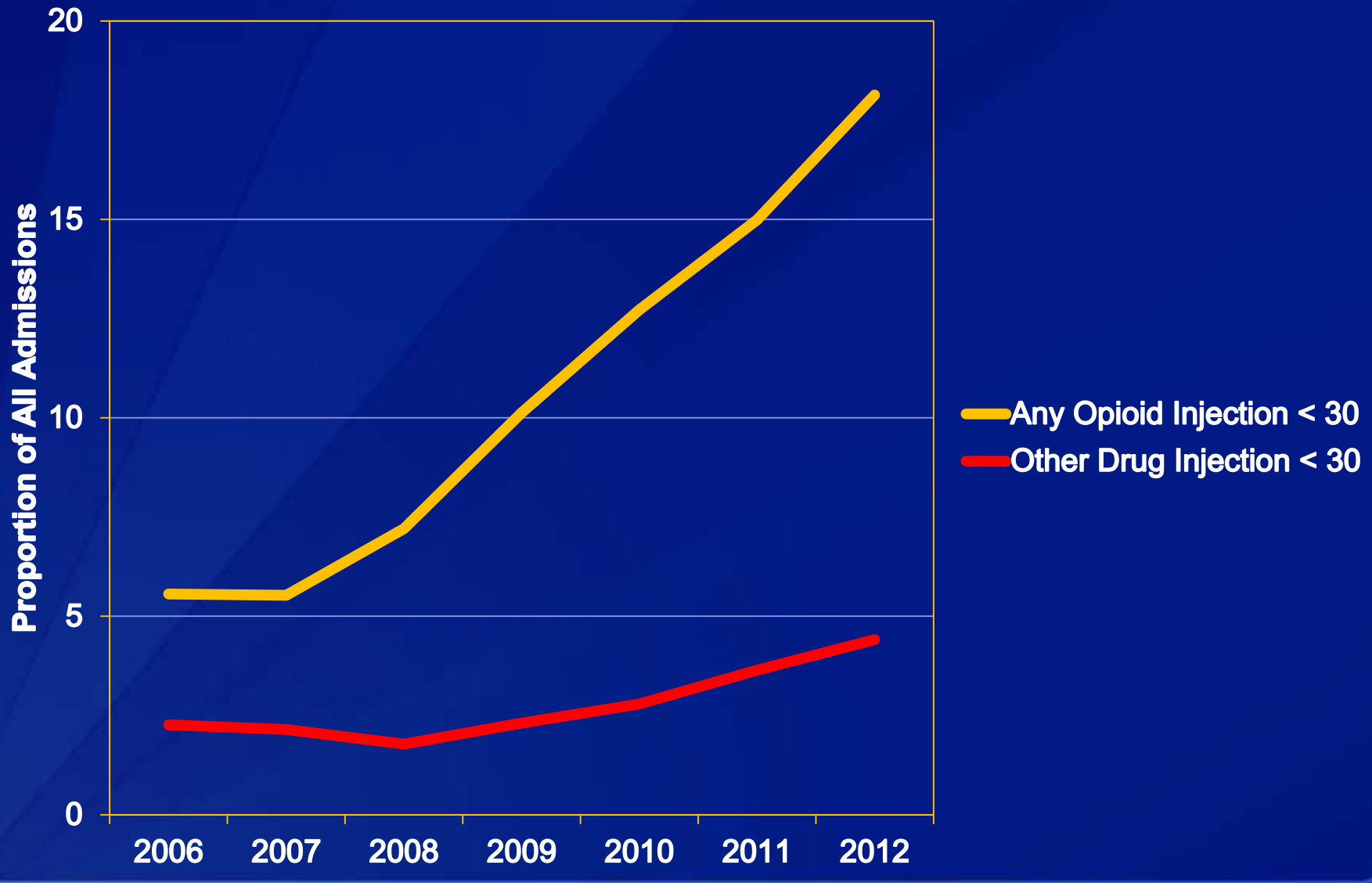
† p-value <0.05

Opioid Treatment Admissions: Regional* Trends <30



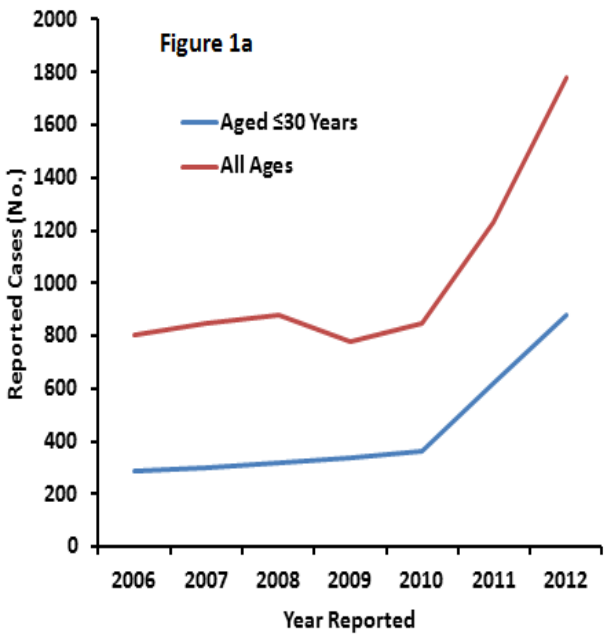
*Four Appalachian States: KY; TN; VA; WV

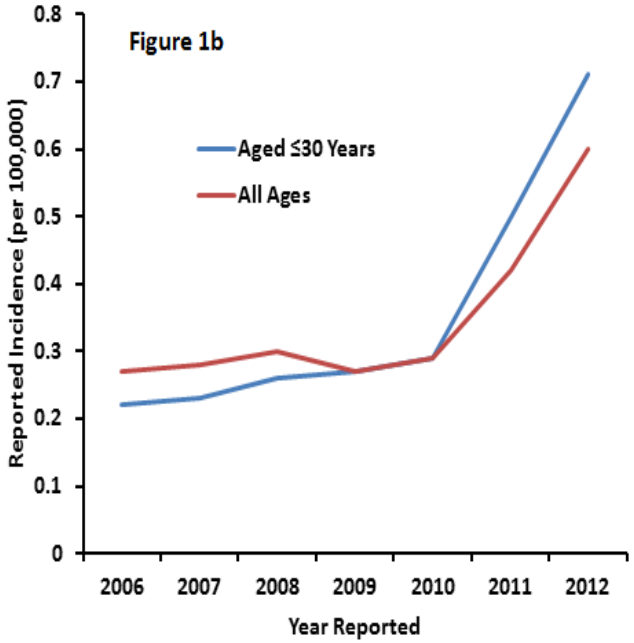
Regional* Drug Injection Trends <30 years old



*Four Appalachia States: KY; TN; VA; WV

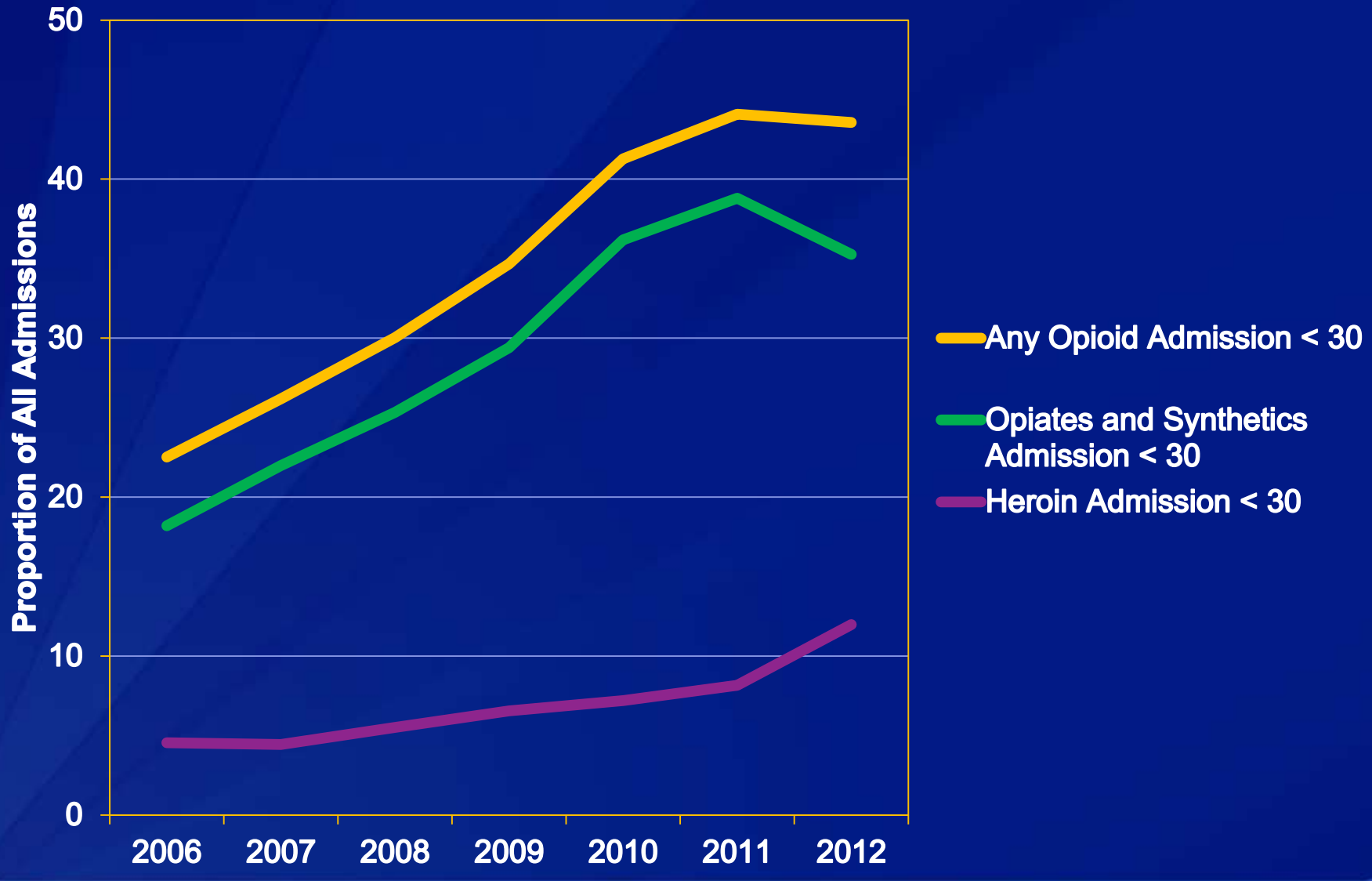
National Acute HCV Cases (2006—2013)





Suryaprasad et al., Clin Infect Dis. forthcoming

Opioid Treatment Admissions: Regional* Trends <30



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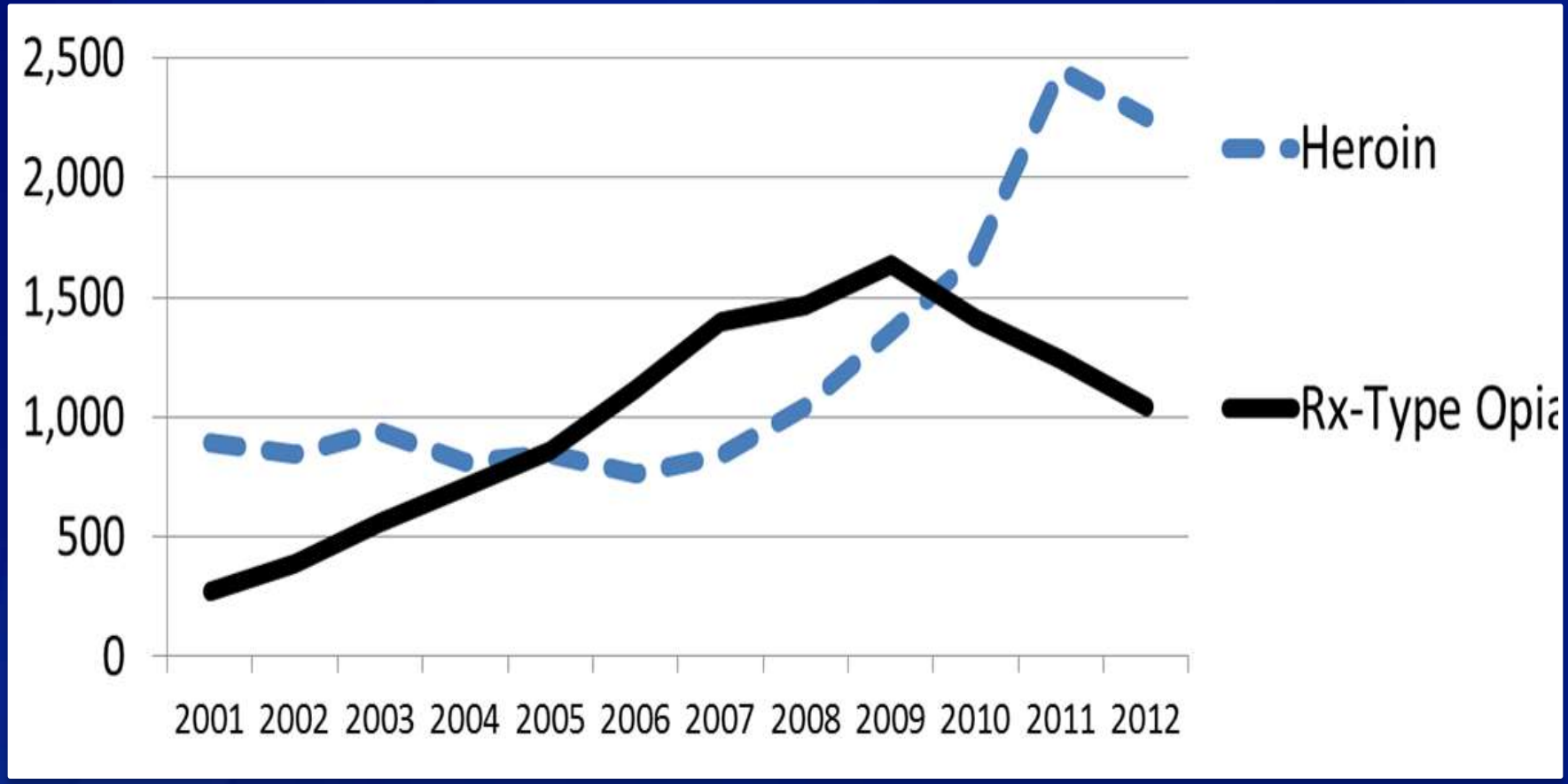
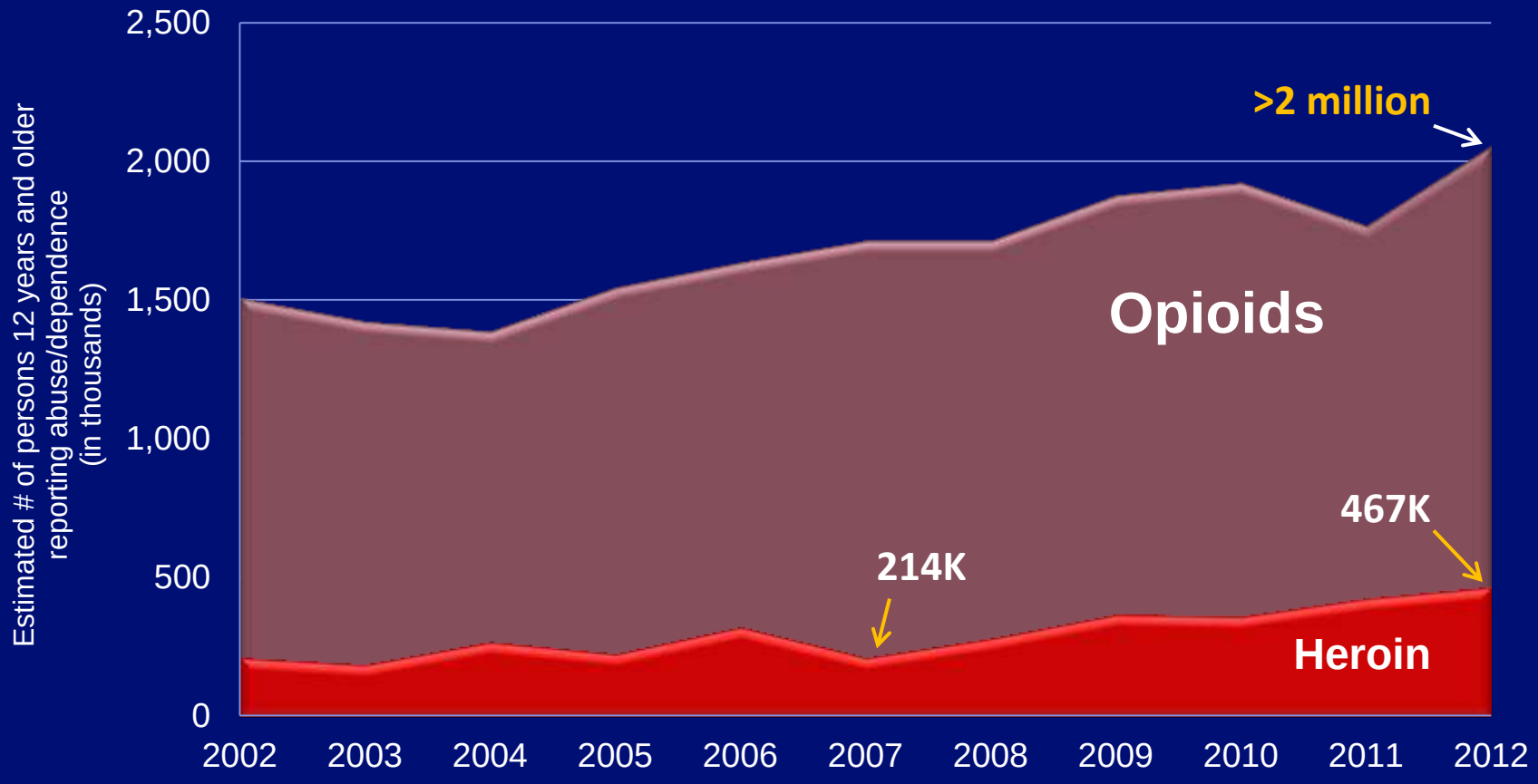


Police Evidence, WA, 2001-2012

(Y axis = # pieces of evidence)

Heroin use and dependence is also increasing



SAMHSA NSDUH 2012

What is to be done?

Effective HCV Prevention Interventions

- HCV Screening and Testing
- Educational / Behavioral Interventions
- Syringe Access
- Opioid Agonist Therapy
- Multi-Component Interventions
- Abstinence-based Drug Treatment
- Treatment as Prevention (“test & treat”)

Increase HCV Screening and Testing

Survey of 197 PWID in *Denver*: HCV-aware engaged in fewer HCV risk behaviors[1]

Survey of 337 PWID in *Seattle*: Participants who knew their HCV status were more likely to share injection equipment with persons of concordant HCV status; i.e. they are more likely to "serosort" injection equipment[2]

National Survey of 9690 PWID: N.H.B.S. participants who knew their HCV status and the HCV status of their last injection partner were more likely to "serosort" injection equipment[3]

[1]Kwiatkowski et al. *Addiction* 2002; [2]Burt et al. *Drug & Alc Dep* 2009; [3]Smith et al. *CID*, 2013

Improve HCV Testing in Correctional Facilities

- ~375,000 incarcerated persons HCV infected
- Contribute to transmission during and after incarceration
- Systematic screening can successfully identify acute HCV
- HCV treatment outcomes in correctional settings similar to community
- Only 12 of 50 state prison systems perform systematic HCV antibody screening

[1] *Weinbaum MMWR 2003;* [2] Gough et al. BMC Public Health 2010, *3* *Kim, Hepatology 2013;* [4]Spalding, Top Antivir Med 2013;

To reduce drug injection initiation

Source: adapted from Neil Hunt, UK,
http://www.exchangesupplies.org/publications/Rtmanual/briefing.html

Increase Syringe Access

- Syringe Exchange Programs (state-sanctioned)
  - Secondary exchange
  - Extra-legal programs
  - Peer-driven access
- Pharmacy sales w/out prescription (pharmacy access)
- Physician Prescription
- Other models outside of the U.S. include vending machines, supervised injection sites

A New Kit for Every Hit!

Multi-Component Interventions (MCI)

An approach to risk reduction where SEPs/pharmacy access and opioid agonist therapy (OAT) programs are combined as “packages” and offered concurrently in the form of a “one-stop shop.”

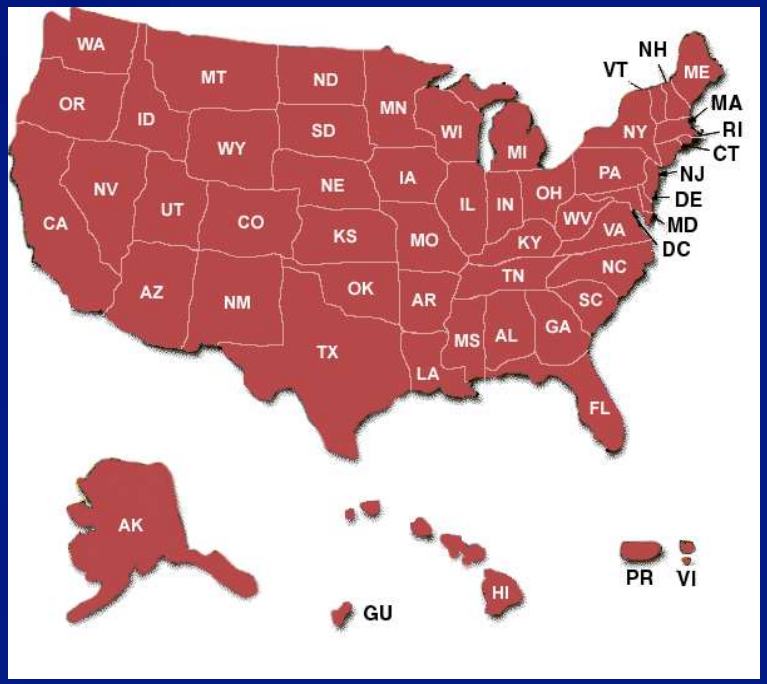
Rather than utilizing one program at a time, MCI incorporates several, low threshold and readily available services simultaneously, increasing the likelihood that PWID will traverse both services based on the status of their drug use.

Explore New Approaches to HCV Testing
Buprenorphine Physician and Treatment Program Locator

SAMHSA
Substance Abuse & Mental Health Services Administration
U.S. Department of Health and Human Services

- All patients prescribed buprenorphine can be tested for HCV infection and linked to care

- Promote HCV education for providers:
  - As a requirement for SAMHSA waiver to prescribed buprenorphine
  - As part of prescription information in SAMHSA Clinical Practice Guidelines



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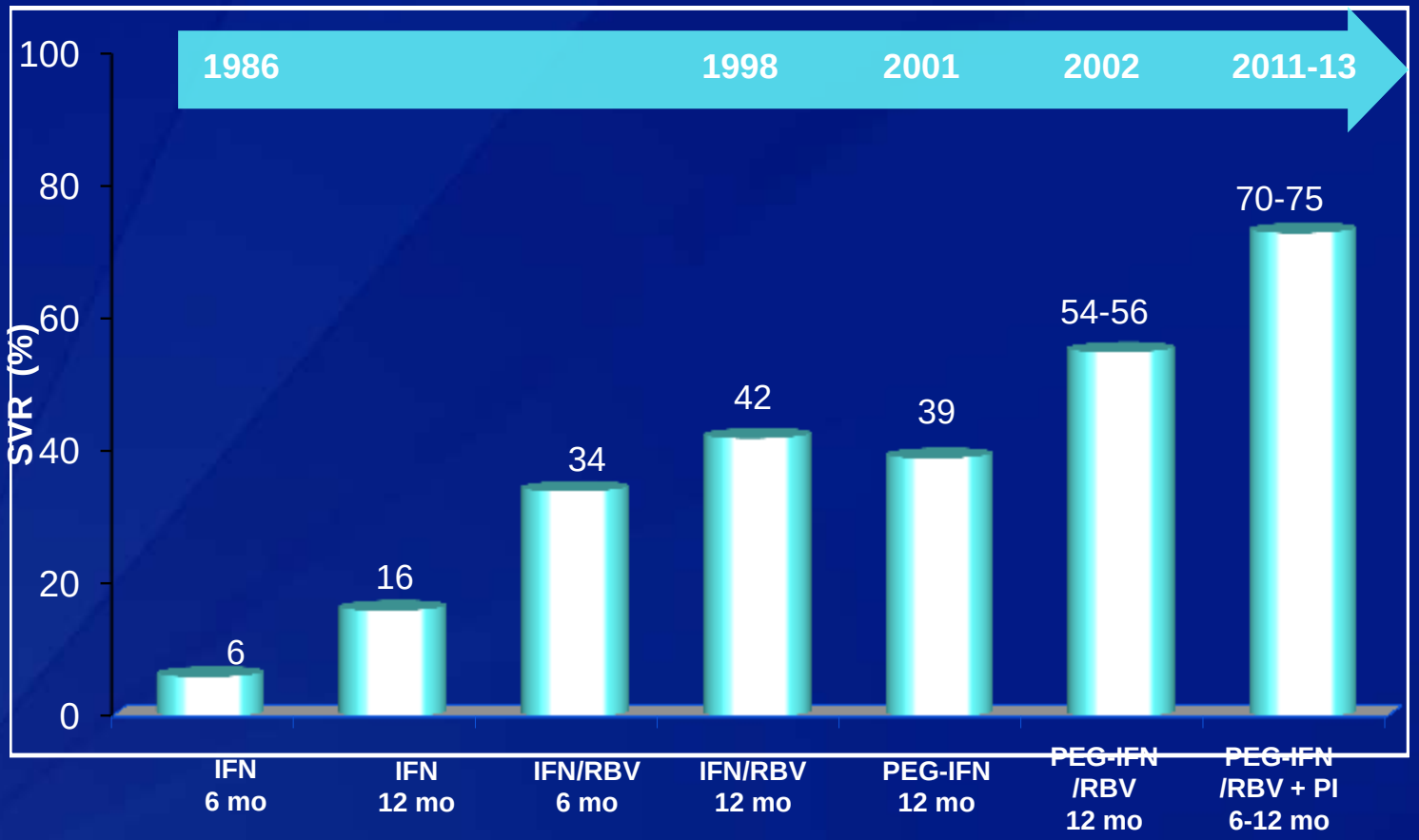
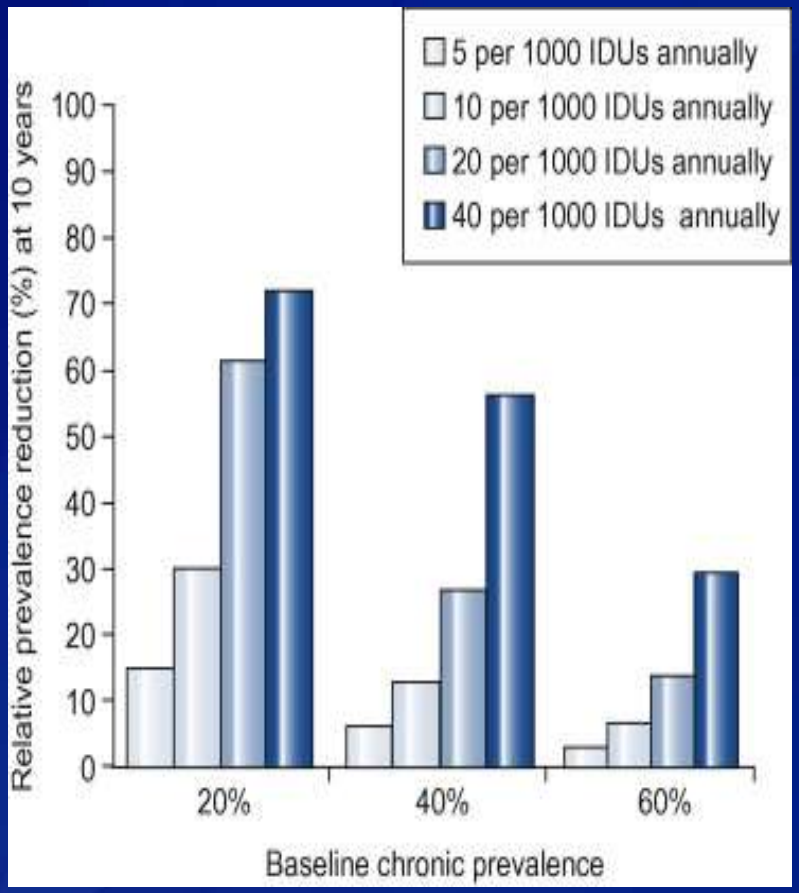
The Evolution of HCV Therapy from Interferon to Direct Antiviral Agents



Strader DB, et al. Hepatology 2004;39:1147-71

Antiviral Therapy Might Be Used to Reduce HCV Prevalence/Incidence among PWID population



- Annually treating 10 HCV infections per 1000 IDU and achieve SVR of 62.5%
- Projected to result in a relative decrease in HCV prevalence over 10 years of 31%, 13%, or 7% for prevalences of 20%, 40%, or 60%, respectively

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Martin et al. Journal of Hepatology 2011 vol. 54 j 1137–1144

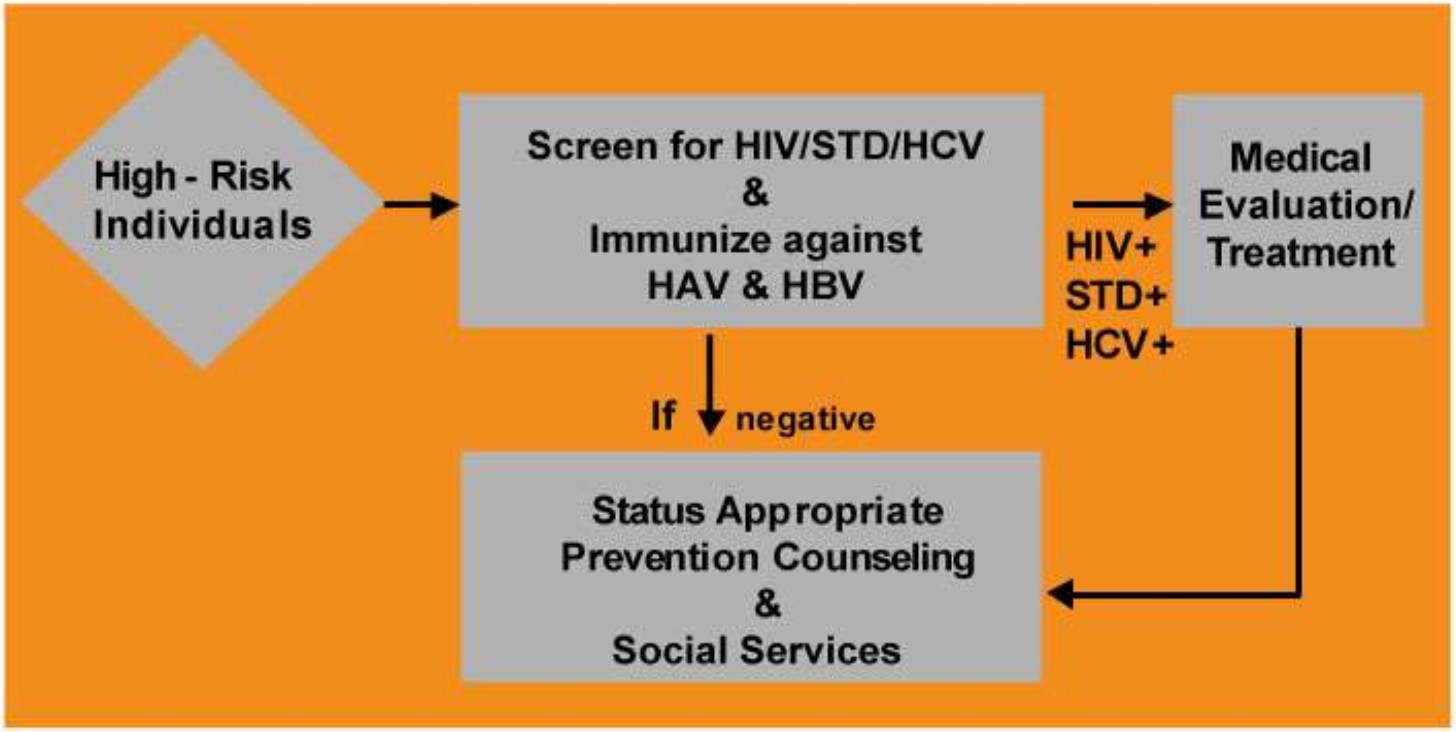
HCV Care via Telemedicine

- Telemedicine offers opportunity to remotely link patients with physicians who are geographically separated.

- HCV care via telemedicine
  - Prior attempts in prisons[1,2] and at rural clinics[2]
  - Web-based interventions have been used for addicted persons[3]
  - Physician interactions via telemedicine has never been attempted in opioid agonist treatment program.

[1] Sterling et al, Amer J Gastro, 2004;99:866; [2] Arora, Hepatology 2010; 52:1124; [3] Tait, Med J Aust 2010;192(11 supp):S15

Comprehensive Approach to Fighting Everything!



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